STRATIGRAPHY AND EVOLUTION OF QUETZALPETLATL CORONA, VENUS: PRELIMINARY RESULTS FROM THE MAPPING OF V-61 QUADRANGLE. M.A. Ivanov[1,2] and J.W. Head[2]. [1]Vernadsky Institute, Academy of Sci., Moscow, Russia; [2]Brown University, Providence, RI 02912 USA. ivanov@pggipl.geo.brown.edu, James_Head_III@brown.edu

Introduction: We are mapping the V-61 1:5M scale quadrangle (50-75S; 300-0E) on Venus as part of our ongoing analysis of the geology, stratigraphy [1], history and origin of major rises and depressions [2] on Venus. During preliminary geological mapping of the V-61 quadrangle we found that the nature and sequence of stratigraphic units there was very similar to that found elsewhere on Venus [1-3]. The most spectacular feature in the area is Quetzalpetlatl corona, which is about 800 km in diameter and characterized by massive volcanic eruptions [4,5]. In our preliminary work we have focused on Quetzalpetlatl in order to: 1) establish a detailed stratigraphy of the corona and adjacent regions, 2) distinguish and trace visible episodes of corona evolution, and 3) compare the stratigraphic and temporal position of the very large Quetzalpetlatl corona with the time intervals of evolution of far smaller coronae and corona-like features in the global geotraverse that we mapped at 30 N latitude [6].

Stratigraphic units and structures at Quetzalpetlatl: There is no evidence for tessera fragments either in the corona core or rim. The oldest visible unit inside Quetzalpetlatl is densely fractured plains (Pdf) which make up isolated equidimensional and elongated fragments heavily embayed by younger lava plains. Kipukas of Pdf are arranged in a radial zone which is oriented in a N-S direction and runs radially to the North from the corona center. Outcrops of Pdf are heavily dissected by numerous short and parallel lineaments, many of which are resolved as fractures. The northern and western portions of the corona rim are made up by a ridge belt which is about 500-600 km long and several tens of km wide. The belt consists of densely packed ridges with morphologically smooth surfaces. Individual ridges of the belt are about 10 km wide and can extend several tens of km in length. Morphologically, the features of the ridge belt appear to be similar to the common ridge belts elsewhere on Venus [2,3]. Locally, material of Pdf is deformed by the features of the belt and this is evidence that the belt is younger. Quetzalpetlatl is broadly surrounded to the S, W, and N by material of regional plains with wrinkle ridges (Pwrl). At the southern edge of the western portion of the rim there is evidence for the embayment of the ridge belt by Pwrl plains. This means that the ridge belt formed after Pdf and before Pwrl. In the southern portion of the corona core there is a cluster of small shields. The shields resemble the typical features of shield plains (Psh),which are abumdant outside of Quetzalpetlatl, and could represent kipukas of the unit. However, such a characteristic of the shields is questionable because of the lack of direct contact between the shields and other units older than the youngest plains, and the liklihood that small shields could be present in the central portion of such a large volcanic cource region regardsless of age. All previous units are deformed by numerous fractures and graben which make up a broad system of features radiating away from the corona center. The most abundant unit at the corona is lobate plains (Pl) consisting of a great number of morphologically smooth radar bright and dark flows. Lobate plains almost completely cover up the core area of Quetzalpetlatl, appear to fill a moat attached to the nothern and western portions of the rim, and make up a distal skirt of volcanic materials outside the corona.

Discussion: Although there is a significant block of tessera eastward from the corona, there are no tessera fragments inside Quetzalpetlatl. This could be due to complete flooding of tessera pieces by later volcanic materials in the corona interior. However, both densely fractured plains and tessera appear to have comparable topography and sometimes the tesssera appears to have higher relief. This suggests that the separation of tessera from Pdf simply by flooding appears implausible. Thus, evidence for Pdf inside the corona and the absence of tessera there suggests that Quetzalpetlatl formed in an area lacking significant amounts of tessera. This makes Pdf the oldest unit in the corona area. Because of the small size of the Pdf kipukas it is hard to decide if the unit is included in the evolution of the corona or existed before the beginning of corona formation.

The first unit which is a significant corona element is the ridge belt. This unit appears to be younger than Pdf and is embayed by the regional plains with wrinkle ridges. Because there are no ridge belts in close proximity to Quetzalpetlatl, it is possible that the belt was formed purely due to corona development. Even if this is the case, the presumably local episode of the belt formation is in the stratigraphic position close to the position of the ridge belts elsewhere on Venus [3]. Wrinkle ridges of Pwrl are circumferentially arranged around Quetzalpetlatl. This suggests that the formation of the ridges could be governed by the stress field introduced by the presence of the corona.

Regional plains with wrinkle ridges, surrounding the corona, are deformed by the radial system of fractures and graben which means that the most prominent extensional features at Quetzalpetlatl were formed after the emplacement of Pwrl. The formation of the radial fractures and graben was followed by massive eruption of the youngest lobate plains. Superposition of individual flows indicates that the formation of the Pl unit took place during several (or many) eruptive episodes. The vast majority of the radial graben are flooded by the Pl material. However, some of the graben appear to cut through the surface of Pl.

The above relationships of the units and structures permit us to outline a generalized scheme of events in the evolution of Quetzalpetlatl. The corona began to form in the area apparently free of tessera and possibly was predated by the formation of the densely spaced fractures typical of Pdf. The next tectonic episode was the formation of a ridge belt which now consitutes the northern and western portions of the corona rim. This episode of compressional tectonics was localized in time (after Pdf and before Pwrl) and probably in space, as suggested by the absence of ridge belt features in the other visible segments of the corona rim [4]. The ridged portion of the rim is coupled with the arcuate moat attached to the outward edge of the rim. The presence of the moat is suggested by a topographic profile across the rim area and the specific pattern of

In *Lunar and Planetary Science XXIX*, Abstract #1483. Lunar and Planetary Institute, Houston (CD-ROM).

distribution of lobate plains outside the NW part of Quetzalpetlatl. The moat must have existed before the emplacement of lobate plains and could have begun to form as a structure complimentary to the ridged portion of the rim. The non-ridged segments of the rim show no evidence for the outer topographic moat. The last tectonic episode at Quetzalpetlatl was the formation of the radially-oriented fractures and graben. The preferential orientation of the late extensional features, however, coincides with the zone marked by the presence of Pdf outcrops. This could imply reactivation of an old zone of weakness by later tensional tectonics. The formation of the fractures and graben system was followed by voluminous volcanism which produced the lobate plains.

Conclusions: The mapping of Quetzalpetlatl shows that the units making up the surface of the corona interior and exterior and the relative stratigraphic position of the units are very similar to those in the stratigraphic scheme described in [1-3]. Te mapping provides the possibility to determine and correlate recognizable episodes of Quetzalpetlatl evolution with regionally mapped units [1-3]. As Quetzalpetlatl evolved, it experienced at least two main tectonic episodes separated by the emplacement of regional plains with wrinkle ridges. The first, a dominantly compressional regime, was responsible for the formation of the ridge belt in the NW portion of the corona rim. It is unclear yet if belt formation was due to the corona evolution itself, or was linked with the formarion of the regionally distributed ridge belts. The stratigraphic position of this episode of tectonism appears to be close in time to the beginning of evolution of the majority of coronae in the global geotraverse at 30 N latitude [6]. The second episode, an extensional regime, led to the formation of the radial system of fractures and graben. The last visible activity at the corona is the emplacement of vast deposits of lobate plains. The morphology, mode of emplacement, and stratigraphy of the lobate plains at Quetzalpetlatl corona are the same as that for lobate plains elsewhere on Venus [1,3,7-9]. Thus, as is the case with the majority of coronae in the geotraverse, Quetzalpetlatl apparently started to form before the emplacement of regional plains and, in a manner similar to a few coronae in the geotraverse, the evolution of Quetzalpetlatl continued through the long period of time until the formation of lobate plains.

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